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plant; according to Daudres it regulates the functions of the blood; according to Mussart it regulates some functions of the human eye as well as the life of the most deadly infectious poisons, like the typhus bacilli.

Since then literature on the same subject has appeared which might fill a new and most interesting volume, in which the most startling fact up to the present would be the fact realized here by that splendid discovery of Professor Loeb, that the act of fertilization in lower organisms, as sea urchins, may be substituted by a given increase in the osmotic pressure of the surrounding medium.

And I may well quote in conclusion his summary that: "At no time since the period immediately following the discovery of the law of conservation of energy has the outlook for the progress of physiology appeared brighter than at present, this largely being due to the application of physical chemistry to the problems of life."

J. H. VANT HOFF.

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#### *PSYCHOLOGY AND THE MEDICAL SCHOOL.*

It requires only a minimum amount of consideration for a person thoughtful of the matter to recognize that in the most essential meaning of the proposition, psychology is the most fundamental of all the sciences: psychology discusses the mental processes whereby all perceptible nature is perceived. As long as men continually and of necessity study each other, subject and object alike in modes of consciousness, that body of related facts and principles concerning mind will remain basal, and, consciously or unconsciously, universal. Chemistry, for example, treating of the composition of matter, arrives at its analyses only through mental processes which it is the business of psychology to explain and to facilitate. Astronomy tells us of the planets and the stars, but the astronomer who is

consciously or unconsciously nothing of a psychologist may readily deceive not alone himself, but the scientific public, as has happened more than once. To the psychologist no longer 'seeing is believing,' as the ancient adage runs, for the nature of man unfolds itself apace and shows fold within fold undreamed.

Yet on other grounds than these, which are theoretical and philosophic, lies the interest of the science of psychology to all who have the opportunity to intelligently learn its principles—men and women value it and usually become more or less absorbed in it because it describes themselves, and, ever more successfully, attempts to explain what is and must ever be the most regarded of subjects to every agent, namely himself, as individual and as social unit. The biologic egotism implanted deep in every soul sees to it inevitably that all one's life, whatever the social status or the life-pursuit, that soul shall study continually itself, with however apparent indirectness or however elaborate the social system of real or hypocritical altruism may be. Indeed, altruism has nothing to do with the deeper aspects of the interest in question, this interest being beneath all altruism, in the organic mechanism. The degenerate criminal and the flower of ethical manhood play alike on the same fragile instrument, one miserably and the other with far better harmony; this instrument is consciousness and the changes that it manifests are constant in one only thing—it is I, I, I, the type, the sum. It is chiefly on this account that psychology is an interesting science.

But besides being the basal and an eminently interesting science, psychology is a sound science, 'new' but soundly scientific, a thoroughly self-reliant and deep-set department of systematized human knowledge. In substance older than Thales, known as methodical since Aristotle, yet

every century has added alike to its mass and to its dignity as a science, every year of late has better shown its interpenetrating relations with other topics of learning and dug its foundations ever deeper into the rock-based ground of human knowledge. From one point of view the science is sometimes at a relative disadvantage because it merges in its upper rarefied air with metaphysics and 'divine philosophy,' so that some have left it in their eagerness to loiter on the paths less fixed, less final; let us hope their wings will bear them there. It is as if the astronomer should become a dreamer wandering among his stars, hoping thus best to make out the almanac or to satisfy the yearning curiosity animating all men on the humble earth. In psychology as in astronomy it is the workers who count most, men and women to whom a sphygmograph or a chronoscope is an instrument as dignified as the pen which writes without experimental mediation the reasoned imaginings of the seer.

But there is a class of persons who harm the fame and progress of psychology among the mass of average men, and the injury these do is devoid of any sort of recompense. These are the irresponsible multitude who know little or nothing of science and who have no desire to know, quite, nay more than, satisfied if in one or the other of a host of shiny masks they can fleece a willing public either of their dollars or their sense, succeeding ordinarily in abstracting both at once. These are the 'mental healers,' the 'metaphysicians,' the 'Christian scientists,' the 'psychologists,' the astrologers, the palmists, the 'mediums,' and their ilk, all of whom more or less of the public consider in some way or other allied with the science of psychology. Mysticism of this grade is for the scientific student an absorbingly interesting topic of research, leading him meanwhile to wonder and to pray—wonder at the shal-

low deeps of the human mind, pray for the day to hasten when education shall be for all men, share and share alike, each according to his needs and his ability. Psychology bears the brunt, necessarily, of many a false system and falser creed whose names any who reads the signs along the pavement may learn full easily, the list above containing some of those most known. But the science of psychology looks on with serenity, complacently expressioned with the consciousness that phenomena like these are part of its own subject-matter, to analyze and to explain. It is the public who are fooled and who wish to be, and them in turn, as the loci of ever-recurring phenomena, psychology studies and characterizes. Deplorable indeed is the ignorance of the mass of men, even in America, concerning this science. To many the name means psychical research, to others some phase of mental healing, to others something, which, chiefly because spelled p-s-y-c-h instead of s-i-c-h, can never come within their knowledge, to others, finally, nothing whatever for they never heard the word.

But even among the educated, too often the notion of this science is such that it is not valued at its proper worth, because its *practicality* is too little understood. Here is suggested one of the future duties of the psychologist—it is time that he demonstrated to the world, the great world as well as to the lesser world of letters, that psychology is properly a very practical science, thoroughly useful to the average man. It is on this basis alone that it is worthy of life. A science seemingly should not be classed with belles-lettres or with pure philosophy, as the means of satisfaction of man's eagerness for abstract knowledge or for an understanding of the aesthetics of existence. These things may in one sense be more than science, but they are at the same time in a different sphere and incomparable. The

progress of the race depends not on the products of pure reason ; did it so depend Plato and Kant would be more than names to the millions of our countrymen, and this splendid Greek of so long ago would be the world's idol in the place of the men who have *done* things and who *do*. Men at large desire science rather than philosophy, for to them rightly the sciences mean progress in living ever better and more easily. Utility is and must remain the unchanging standard by which a science, like all other things in the last resort, is measured. This fact many psychologists apparently have overlooked, so brief at present has been the time since their science freed itself, by working out the outlines of its proper sphere, from the conservatism of philosophy. Right well and exceedingly is psychology fitted by its subject-matter to demonstrate and then to enlarge its human usefulness. By necessity of the 'struggle for existence' (so inevitably often emphasized in every sociological discussion), all men are psychologists and not less so that only one in a million thinks of himself as such. Somewhat in proportion to his practical success as a psychologist, consciously or unconsciously, in proportion, that is, to his knowledge of his fellow-men and of himself, does a man or woman succeed in life. It means more than anything else this wisdom in human nature. The schoolboy knows his teacher more or less well as he recites to him or seeks to win his favor ; the candidate for the doctorate very likely has studied the faculty only less than his research, and at the time when each word counts he uses well his information. The merchant studies the man from whom he buys his stock, and doubtless still more carefully the 'market,' which is only a convenient term for the balance of the hour between merchandise and men's desire therefor. The business man depends even more largely on his knowledge of human nature in his dealings

with a public which is always more or less suggestible. The actor studies humanity that he may imitate it, the conjurer that he may deceive it. The judge in court is pre-eminently a practical psychologist, the policeman less so, while the value of the jury system and the virtue of a particular juror often depends directly on the jury's rightly weighing the human probabilities of motive and of action. Such values are practical and real.

But more than others, if possible, 'professional men' should be good, that is, practical, psychologists. They should understand completely the psychophysical nature of men and women to be successful. The clergyman must preach the Gospel, but he must preach it both in the spirit of the times and in the spirit of his hearers—not preaching hell-fire when the advancing rationality has put hell-fire forever out and named it cruelty ; not preaching sermons two hours long when men in general might fairly be satisfied with half-an-hour. So too the lawyer (and in a perhaps even larger degree) must be a psychologist, whether he knows it or not, if he is to please his client and enlarge his practice. He must know well the relative value in a particular man of feeling and of cognition, must value rightly his client's strength of will and perhaps his cleverness under cross-examination. In every phase almost of the lawyer's professional life his knowledge of himself and of man in general forms his chief stock-in-trade. The lawyer's success largely depends on his acquaintance with man's mind and how it works—his science above all is the 'science of the soul.'

To medicine, the third of those pursuits long classed as professions, we now turn to see how, in a more immediate way than has so far been considered, psychology is naturally related to it. Like other men, the physician is of course a practical psychologist so far as his native instincts lead him

to become so. For reasons, however, which will be pointed out below, the medical man needs a more exact and systematic knowledge of the relations of the human mind than the hereditary common wisdom of the race provides him with, while at the same time his opportunities for acquiring this knowledge at present are either entirely lacking or quite impracticable for the average practitioner. It is a fact that the men who, for the public benefit, require the largest amount of insight into mind and its relations with body, have had thus far the least convenience for acquiring it. This condition is probably a relic of that same ancient fallacy, so very frequently encountered everywhere, that material objects (here the tissues of the body) are more real and more important than things which are immaterial, ideas and emotions and the determinations of the will. Yet most old men and women would tell you that these latter things had influenced their lives far more than matter of any sort whatever. For every person maimed by a material accident a dozen are maimed by some one's will or emotion or idea.

The physician needs some direct acquaintance with the science of psychology, because, in part, he is properly the self-elected teacher of the public, and to every teacher, of whatever sort, psychology is by reason of its nature necessary foundation-knowledge; to argue otherwise is sophistry, convincing to none. The average physician, that is to say, most physicians, are not teachers of the public in hygiene, physiology and general prophylaxis to half the measure that they might be, some from inability, some from thoughtlessness, some from 'inertia,' some possibly from indisposition so to do. But this duty of the medical man is a privilege and its compensations out of proportion to its costs. Herein lies the general affection for the old-time family doctor, the most contented and best re-

quited of his profession, the friend and confidant rather than the hireling of his neighbors. Practical psychologist that he was, when he entered a house, patient and household at once felt better even though death were near.

In ways, however, more immediate to his cases than in this position as medical educator to the public does the physician need to know the principles of modern psychology in a broad meaning of the term. He requires it because always in his practice he is concerned with living and social organisms who invariably are compounded of *both* body and mind. As regards the wholly obvious necessity of acquaintance with the normal mind for the many medical graduates who pay chief attention to mental and to nervous diseases, much might be said, although little will be, here. Even these, alienist and neurologist (although usually versed more or less, late or soon, in the substance of empirical psychology, while some are competent and even distinguished psychologists), even specialists in the mind, have at present no adequate opportunity to learn the substance of the science in a thorough systematic way. Many of our distinguished alienists have enjoyed a general college education and some have been led by the psychology learned meanwhile to 'specialize,' when their medical degree was acquired, in the diseases of the mind. But these educational privileges are relatively infrequent and with our present system of college education must remain so some time, most medical schools being not yet, by probably many years, post-graduate institutions. Yet insanity appears, by reliable statistics, to be on the increase; and to meet the certain demand for the care and proper treatment of these patients, a larger proportion of all medical graduates will, by economic principles, devote their attention to this most important branch of therapeutic science.

To meet the necessities of this class of practitioners alone the establishment in the medical schools of courses in normal medical psychology is urgently demanded. To graduate a psychiatrist without this knowledge is like pretending to qualify a general practitioner without teaching him physiology. Exceedingly few of the graduates, eager to get at actual cases, and the best of them soon enough crowded for time, will or can take up the long-drawn unadapted psychological courses in the universities and colleges, nor, did they desire to do so, would funds be often at their disposal, the debts of the young doctor being often, as it is, quite sufficiently appalling to the young man anxious then to earn as fast as possible. For the sake of these men alone, then, courses in medical psychology should be provided where alone they will be studied with the splendidly productive medical-student eagerness and attention.

The education given, or rather sold, to the medical student seems in general, however, too grossly materialistic, too somatic. He learns but one side of this two-sided story; from the first year to the fourth, from the dissecting room to the gynecological or otological clinic, the routine student sees and hears of muscles and bones, and viscera, sense-organs, nerves and vital fluids, but little, unaccountably little, of that other aspect of men and women which to these very men and women is their life, while these other, these organs, are but needful instruments of that life's attainment. And their point of view, it need not be said, is also that of philosophy; shift it, and illogical confusion follows. The layman cares little or nothing for his stomach's condition so long as it gives him no pain and takes good care of what his will and his appetite lead him to supply to it. The woman in search of a happy family life thinks seldom of her reproductive mechanism so long as it gives her healthy children whom she can love.

There is something besides cell-built tissue for the gynecologist in charge of an operative case to consider when of two women, alike in vigor, who undergo identical ovariotomies, for example, one goes in three weeks from the hospital a new woman, cheerful, capable and happy, while the other becomes an hysterical wreck never perhaps to equal her former self in happiness or in health. As every surgeon knows, such differences are met continually and they puzzle him. Why is it that present medical education takes no account of the principles underlying phenomena like this? So far as the student is concerned, the course, four years or three years long, quite ignores in general the emotional and temperamental factors which in one way or another, directly or indirectly, less or more, enter into almost every chronic case and into many of the acute cases which the general practitioner is called upon to treat. Instead of striving to teach the student what conditions underlie mental habits and idiosyncrasies, medical instructors are now content practically to ignore them, regardless of possible great benefits to come from their study as psychological data. Too often is the medical man the most materialistic-minded member of a community, when his view should be much deeper, into the controlling forces of life. This is the natural outcome when in a long medical course no part of the individual is presented to the student except what he can feel with his hands or see through the microscope. Yet how commonplace is the assertion that the man, the real man or woman, is not his or her body, but the will, affections, habits, character, of the individual, while (what is more immediate to our argument) these same aspects of consciousness are often the direct molders or destroyers of disease and, as one side of an inseparable psycho-physical organism, have more control or influence over the functions purely somatic

than the average practitioner of medicine appreciates. Not mind controlling body nor body controlling mind, but both together always sensitive to the stimuli of a common environment combined into the actual individual.

The conventionalized and systematized knowledge of conditions thus important in treating disease is a portion of psychology. Crude indeed are its names and its conceptions as crystallized in names compared with the empirical reality, but it is of necessity that they are crude and only representative or symbolic that a science may be constructed and discussed. A new medical psychology adapted to its special usefulness would very soon develop a terminology of its own, fitted to the case. The term temperament, for example, vague and little really explained by general psychology, would, as a subject in medical psychology and in the minds of physicians, soon take to itself more explicit meaning, adapted to its use. By this natural process of specialization of sensemedical psychology would suffer relatively little from that variation in meaning among different writers, from which general psychology (from the abstract nature of its matter) suffers much misunderstanding within itself. By thus fixing the meaning of certain terms, and that probably in more or less direct relation with concomitant somatic conditions, medical science would do a distinct service to empirical and physiological psychology, and more substantially than any dictionary could do it.

A normal medical psychology, to be at once scientific and comprehensive of the field, would very likely set out with a relatively brief exposition of genetic and of empirical psychology, discussing thus in certain and uninvolved terms the classification of mental processes under cognition, feeling and will in the ordinary elementary way. The more physiological in nature the treat-

ment of this portion of the subject, the better would the medical student connect it with his knowledge of the body gained earlier in his course. With these principles of the science as a basis and point of departure into allied branches of science, the topics more immediately practical to the physician might be taken up in a series as much unified logically as possible. In this, the immediately practical portion of the work, the field would naturally and necessarily spread out somewhat so that it would be important to enter briefly at times into anthropology (anthropometry especially, perhaps), criminology and certain departments of biology, notably that regarding the heredity of mental traits. Still, obviously, the greater part of the discussions would lie strictly within the domain of psychology as it is empirically studied to-day, using for its own purposes, as it does, the products of many different varieties of scientific research.

The topics of medical and surgical importance which such a course might examine into with benefit and interest are very many, as any medical man will recognize. They are subjects such as those below are examples of, placed here almost at random so far as order is concerned, namely, temperament, mood, idiosyncrasy, pleasure, pain, emotion, anaesthesia, hypochondriasis, dynamogeny, will power, sleep, subconsciousness, habit, sexual, racial and epochal differences, suggestibility, hallucinations and other scarcely abnormal phenomena of the sense-organs and their neural centers. To mention only suggestibility, the habits and sexual psychology out of this list will perhaps be sufficient to show how important a course treating of such topics might be made by a competent man. Continually is suggestive therapeutics taking a larger share in the treatment of certain chiefly psychical diseases, and to explain its nature, uses and limitations is to equip every physician

better than now he is equipped. Again, who could exaggerate the importance of the habits in causing misery and in curing it? And lastly, in these days sex is taking ever more rapidly its proper place in the science of 'things as they are,' monstrous often to the layman, and properly, but to the physician natural and preeminently important. A widely related discussion of such topics as these, it seems to the present writer, would furnish to a medical student of the necessary mental development, facts and relations as important for his professional purpose as most of those which are at present taught him. Such a course would do much to supply the lack of knowledge of man's dual nature, which, as has been sufficiently suggested, usually obtains in the average physician. This would be its chief value in a medical curriculum, but not its only one. It would also supply that needful amount of psychology which would allow the usual courses in psychiatry and neurology to be better appreciated and more completely understood, especially of course as concerns those conditions, such as hysteria, neurasthenia, paranoia, dementia paralytica and the rest in which a purely 'mental' aspect is often or always prominent. It would help to make such conditions really understandable so far as their description at least is concerned, whereas at present, the ideal disturbances, notably in paranoia (very commonly met with), are far beyond the understanding of the medical student, for lack of acquaintance with the theory of normal ideation. It would make such conditions seem like scientific problems pressing for his solution rather than like mere arbitrary sets of ill-understood events which he must learn by rote and the memory of which, when occasion offers, he must mechanically apply.

In form such a subject might easily be comprehended in a course of weekly lec-

tures during the former half of the fourth year of the medical curriculum, either elective or required. It need involve of course no laboratory work, nor would this be fitting, sufficient demonstrations being used to illustrate certain points and to increase still more the students' interest.

It is not difficult to understand why something of this sort has not already been introduced, instruction which would impart the suitable product of the progress in these directions in the last few years. The progressive spirit of the various medical faculties has been employed of late, for the most part, in establishing departments of bacteriology, pathology and experimental physiology, and in enlarging various modes of clinical experience. These have now in all schools of the first class become flourishing departments, demonstrating well their importance. Thus other fields have naturally been neglected in these new years of the sciences of the bacteria. It seems time now that the growing energy of the medical schools should look around more widely and realize, with practical benefit, that if emotions cause at times disease as well as the bacteria, so it is equally important that the conditions of the one should be taught the student as well and as certainly as those of the other. Not at once as a universal means of progress will this enlarged and more scientific mode of viewing every patient be shown the student of the medical sciences, but assuredly it will come, and in some form not wholly unlike that which has here been all too rudely sketched and for reasons similar to those here pointed out. Such a course by a psychologist of wide interests and information among branches of learning of allied aims, a medical man if possible, would seem to be worthy at least of trial in every medical school whose avowed purpose it is to provide its graduates with a knowledge of men as they are, and not

alone to furnish them with the science of one-sided and therefore false somatology.

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*THE BOTANICAL WORK COMMITTEE.\**

A BLUE-BOOK (205) of 247 pages has been issued containing the report of the committee on botanical work and collections at the British Museum and at Kew. The Committee was appointed by the Treasury on February 1, 1900, 'to consider the present arrangements under which botanical work is done and collections maintained by the Trustees of the British Museum, and under the First Commissioner of Works at Kew respectively; and to report what changes (if any) in those arrangements are necessary or desirable in order to avoid duplication of work and collections at the two institutions.' The chairman of the committee was Sir Michael Foster, M.P., and the other members were Lord Avebury and Mr. F. D. Godman, representing the Trustees of the British Museum, Mr. S. E. Spring Rice, C.B., Mr. H. A. D. Seymour, C.B., Professor I. B. Balfour, Queen's botanist for Scotland, Mr. F. Darwin, reader in botany in the University of Cambridge, and Sir John Kirk. Mr. B. D. Jackson, secretary of the Linnean Society, was afterwards appointed secretary to the committee. The report opens by pointing out the essential differences between the Botanical Department of the British Museum and the Royal Botanic Gardens at Kew.

The former is a collection of such objects as can be placed in a museum, and is not concerned with the applications of botany; whereas the latter, besides constituting a public garden, is an organization which gives assistance to the government on questions involving botanic science in all parts of the Empire. Both possess herbaria with

libraries attached; and the two herbaria, though each possessing some special features, are to a very large extent duplicates of one another. This duplication of specimens entails, of course, a duplication not only of housing room, but of scientific work and of the scientific staff; and the existence of this waste is a strong *prima facie* argument against the maintenance of the collections in their present form. The report observes that the question of amalgamating the two collections has been considered by committees again and again, and after considering the arguments urged on both sides, the Committee, with the exception of Lord Avebury, pronounce in favor of their union. Their report discusses at length the possible methods of union, the relative convenience of Kew and the British Museum as sites, and the question of constituting a special advisory board, on which the Trustees of the British Museum should be adequately represented, in the event of the removal of the greater part of the British Museum collections to Kew. The recommendations on these points are summed up as follows:

(1) That the whole of the botanic collections at the British Museum now administered by the Keeper of the Department of Botany under the Trustees, with the exception of the collections exhibited to the public, be transferred to the Royal Botanic Gardens, Kew, and placed in the charge of the First Commissioner of his Majesty's Works and Public Buildings under conditions indicated below, adequate accommodation being there provided for them. (2) That a board, on which the Trustees of the British Museum, the Royal Society, and certain departments of his Majesty's government should be directly represented, be established in order to advise on all questions of a scientific nature arising out of the administration of the gardens, the powers and duties of the

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